Cement MILL SECTION of

Concrete

Vol. 21 JULY, 1922 No. 1

Missouri Lime Plant Reconstructed

The lime plant of the Peerless White Lime Co., a subsidiary of the Hunkins-Willis Lime & Cement Co., of St. Louis, Mo., located in Ste. Genevieve County, Missouri, on the Missouri-Illinois Railroad, has been rebuilt after having been almost completely destroyed by fire about a year ago, and is now considered one of the most modern lime plants in the West.

The products of the company, Peerless limestone, White lime, and hydrated lime, are generally known throughout the United States for their high quality and calcium content. As evidence of quality, shipments are made regularly to many customers in the Atlantic Coast states, to all northern territory, as far south as Pensacola, Florida, and west to Tacoma, Washington.

In the quarries both open face quarrying and mining operations are employed to produce the stone for the kilns. In the open quarry drilling is accomplished with a Cyclone well drill,[1] while in the mines Waugh Dreadnought rock drills[2] are used. All kiln rock is hand-picked, to insure nothing but the clean and highest grade stone going into the finished lime products. Two Bucyrus steam shovels[3] are in use for cleaning up and stripping, the larger of 75-ton capacity, mounted on standard gauge trucks, and the smaller on traction wheels.

The stone is loaded in cars of three-ton capacity, which are specially constructed at the plant and are gathered and hoisted to the kilns by means of cable operated by steam power. The bodies of the cars are removable from the trucks, and arriving at the base of the kilns are hoisted to a carrier over the kilns and conveyed to any particular kiln and the stone automatically dumped where it is required.

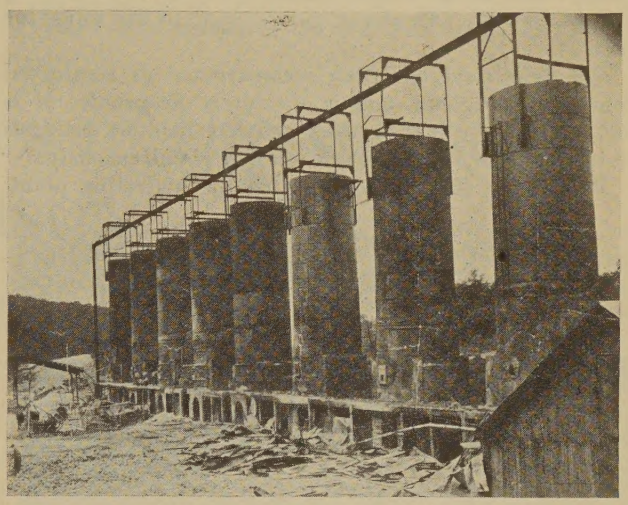


Fig. 2—Kilns and Lime Floor Two Days After Original Plant Was Destroyed by Fire

Eight kilns of the vertical type, with diameter of 14 ft. and shafts 5 ft. by 7 ft., with a capacity of 20 tons per day per kiln, produce the burned lime, which is drawn from the kilns into steel buggies of ½-ton ca-

[1]Cyclone Drill Co., Orrville, Ohio.
[2]Denver Rock Drill Mfg. Co., Birmingham, Ala.
[3]Bucyrus Co., South Milwaukee, Wis.

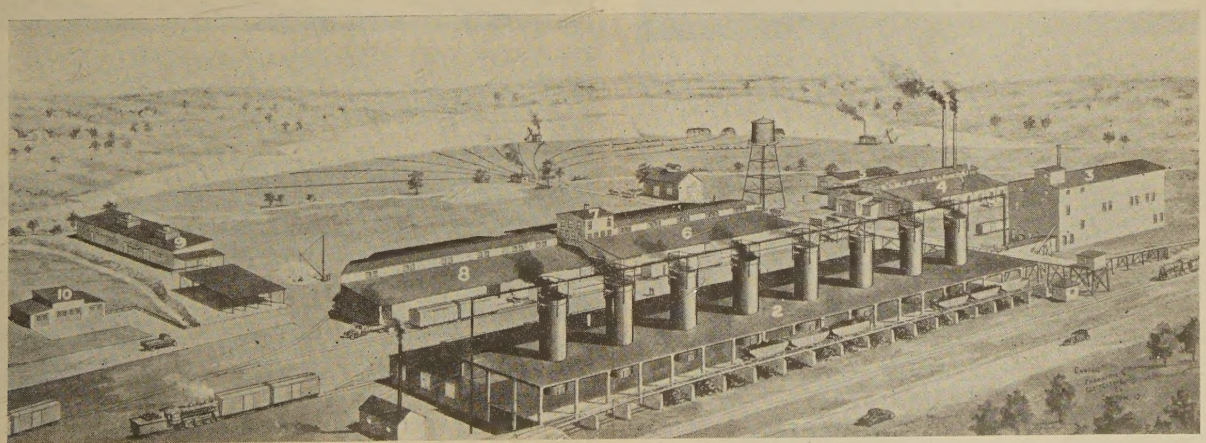


Fig. 1—Plant and Quarries of Peerless White Lime Co.—(1) Lime Shed, (2) Kiln Firing Shed, (3) Hydrating Plant, (4) Power House, (5) Machine Shop, (6) Warehouse No. 1, (7) Office, (8) Warehouse No. 2, (9) Cooper Shop, (10) Garage

FIG. 3—VIEW OF QUARRY, SHOWING TUNNELS DRIVEN INTO FACE, AND ALSO SHOWING OPEN FACE QUARRY WORK

pacity, and dumped on the lime shed floor for cooling and inspection. Producer gas is used in all kilns for fuel.

The lime shed has been reconstructed of reinforced concrete throughout, and is absolutely fireproof. It is 300 ft. long by 90 ft. wide, and has loading facilities to take care of from eight to ten cars simultaneously.

Beyond the lime shed is located the hydrating plant,

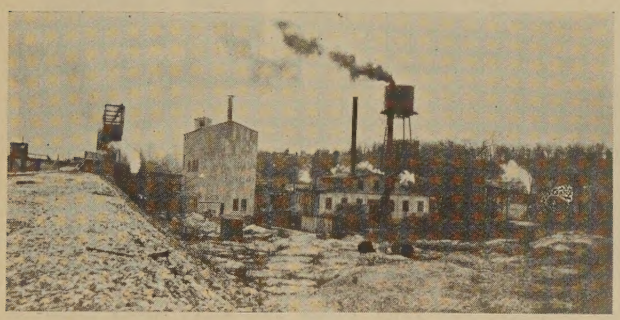


FIG. 4—COMPLETED HYDRATING PLANT, POWER PLANT, WATER TANK (CAPACITY 60,000 GALS.), AND PARTIAL VIEW OF QUARRY

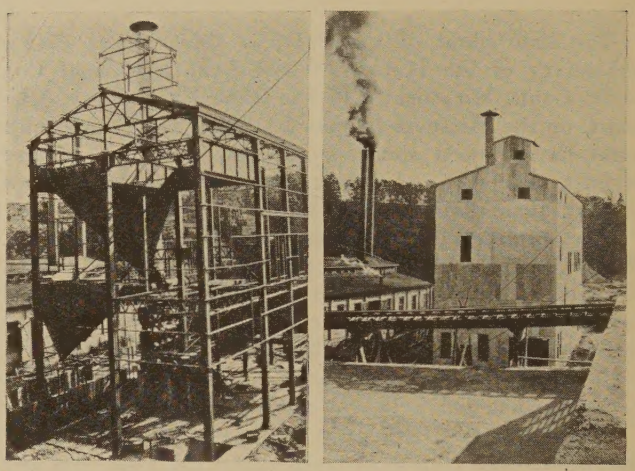


FIG. 5—HYDRATING PLANT IN COURSE OF ERECTION—BUILDING CONSTRUCTED OF STRUCTURAL STEEL COVERED WITH GALVANIZED IRON—KRITZER HYDRATING SYSTEM USED

(RIGHT) ANOTHER VIEW OF COMPLETED HYDRATING PLANT AND POWER PLANT—THIS VIEW TAKEN FROM ROOF OF LIME SHED

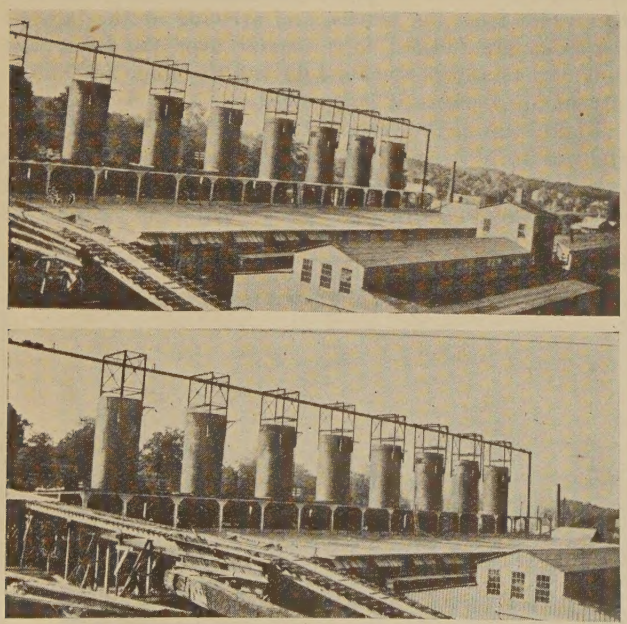


FIG. 7—VIEWS SHOWNIG THE EIGHT KILNS, CAPACITY 160 TONS PER DAY

The lime shed, as well as shed between the kilns, is of reinforced concrete. The lime shed is 300 ft. long by 95 ft. wide. Also note two storage sheds each 150 ft. by 60 ft., also Superintendent's office. Between lime shed and storage warehouses are two double tracks, thus giving perfect facilities for prompt loading and shipping,

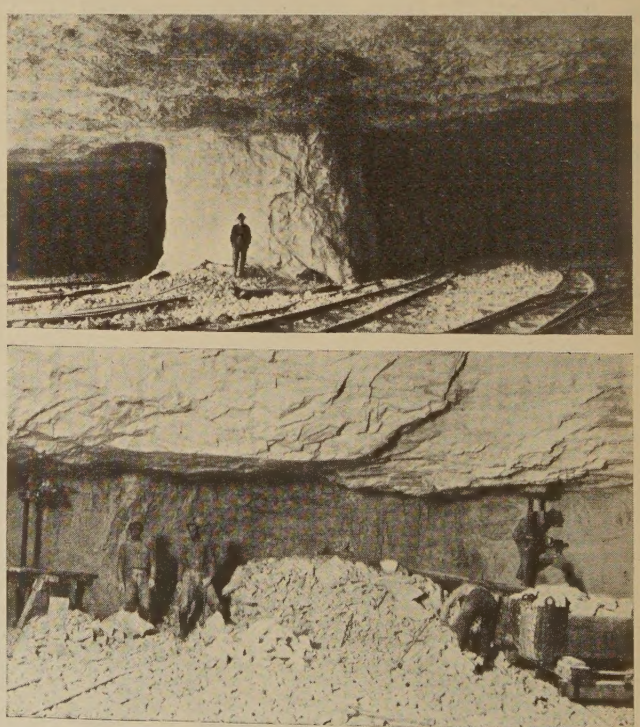


FIG. 6—INTERIOR OF TUNNEL, SHOWING MINING OPERATIONS

constructed of steel framework, covered with galvanized iron. This plant has a capacity of 100 tons of hydrated

lime daily, which can be doubled by the installation of another hydrating unit, all provisions for such increase having been made when the plans were originally drawn. The Kritzer method of hydration[4] is employed. The lime is conveyed from the lime shed floor to the hydrating plant, and fed into a Sturtevant crusher,[5] where it is reduced to 3/8 in. and smaller and then elevated to a bin over the hydrator. The lime quantity fed to the hydrator is constant, the supply of water being regulated in proportion to the calcium oxide content, and by a system of circulation through the hydrator the water content is kept within 1/2% of a theoretical hydrate.

From the hydrator the product is discharged directly into the Raymond air separator,[6] where all foreign particles of rock and core are eliminated, producing a finished hydrate testing 99.9% through a 200 mesh sieve.

From the air separator the hydrate is discharged into a bin over a Bates valve bagger,[7] by which it is packed into packages ready for shipment.

The power house equipment consists of three horizontal tubular boilers having a total of 300 h. p., one 120 h. p. Corliss engine,[8] and one smaller engine for emergency use; two Laidlow air compressors,[9] one double action for daily use, and a smaller single action, for emergency.

The company is now installing a large Ruggles-Coles dryer[10] for use in drying rock preliminary to fine grinding. In the near future it will be prepared to furnish high-grade limestone, pulverized to almost any degree of fineness.

[4]Kritzer Co., Chicago, Ill.
[5]B. F. Sturtevant Co., Hyde Park, Mass.
[6]Raymond Bros. Impact Pulverizer Co., Chicago, Ill.
[7]Bates Valve Bag Co., Chicago, Ill.
[8]Lane & Bodley Co., Cincinnati, Ohio.
[9]Worthington Pump and Machinery Co., New York City.
[10]Ruggles-Coles Engineering Co., New York City.

Magnetic Clutches in the Cement Industry

By W. H. Costello
Cutler Hammer Manufacturing Co.
Milwaukee, Wis.

In the early days of the cement industry, when grinding units were of relatively small capacity, motors of 75 h. p. were sufficiently large for power purposes. With the introduction of ball and compeb mills, carrying heavy charges of metallic grinding medium, and the building of larger units, motors of much larger capacity were required. The modern tube mill uses a motor within the range of 200 to 600 h. p.

Being essentially a constant-speed load, there would seem to be no question but that the synchronous motor, operating at unity power factor, would be the obvious selection. The tube mill, however, requires 140% to 150% of full motor torque to start, even under the most favorable conditions, and the synchonous motor is not capable of exerting this high torque during the starting period. Slip-ring motors were, therefore, quite generally adopted for this service.

The possibility of employing synchronous motors had been given serious consideration, but, the question of the type of clutch to use could not be satisfactorily settled until 1918, when the first synchronous motor and magetic clutch unit was installed in an Ohio cement mill. Magnetic clutches at that time were well beyond the development stage, having been used for several years previously with synchronous motors in rubber mills, and for starting centrifugal pumps and machines of similar nature. These facts were well known to operators in the cement industry, and also to tube mill manufacturers, but the adoption of synchronous motor drives was nevertheless delayed until it became apparent that magnetic clutches had overcome the inherent objections usually associated with the prevailing types of clutches. Power cost had also become a factor requiring serious consideration, so there was a greater desire to employ synchronous motors operating at unity power factor. The first magnetic clutch installation had all the demands imposed upon it, with the result that the combination of synchronous motor and magnetic clutch was soon accepted as a fully reliable drive. At the present time there are approximately 75 units in operation in the United States, Mexico, India, and Australia.

Operation of Magnetic Clutch

The principle of operation of a magnetic clutch is clearly shown in Fig. 3. The field member is an electromagnet containing an annular coil, and the armature member serves as the armature or keeper which is drawn towards the field member when the coil is energized. On the outer rim of the field member is a flange carrying a friction surface, and the armature member is extended to come into engagement with this friction surface. When no current is flowing in the coil, the armature member stands a short distance away from the friction surface, giving a positive running clearance. When it is desired to engage the clutch, the coil is connected to the

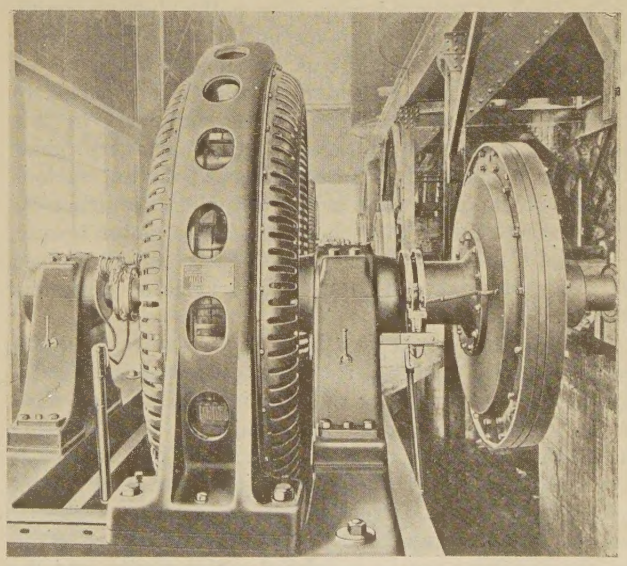


Fig. 1—60-in. C-H Magnetic Clutches Used in Connection with Synchronous Motors Driving Compeb Mills, Bessemer Limestone & Cement Co., Lowellville, Ohio

line through a suitable switch and the magnetism produced in the field member draws the armature member against the friction lining. The friction between the lining and the armature member drives the load.

Torque Requirements

It is customary practice to select a clutch capable of transmitting slightly more than the maximum horsepower which the synchronous motor can develop. That is, if a cement mill motor, rated at 400 h. p. normal, will develop 800 h. p. maximum, the clutch should be capable of transmitting somewhat more than 800 h. p. to insure that the clutch will not slip while carrying the load. The fact that an oversize clutch can be used without endangering the mill permits manufacturers to use a single size of clutch to take care of a range of mill sizes, and thereby gain the benefits of standardization.

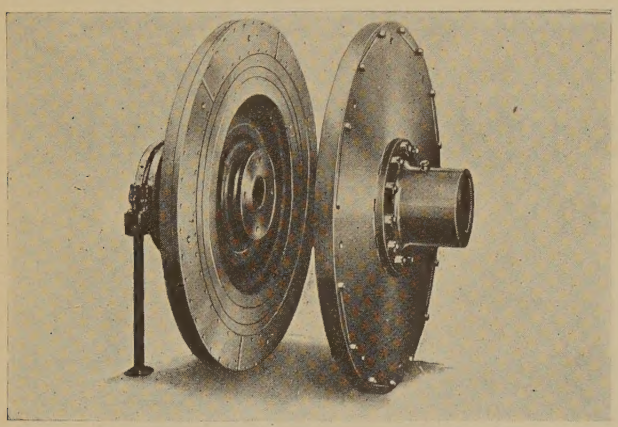


Fig. 2—Exploded View 60-in. H-60 Clutch

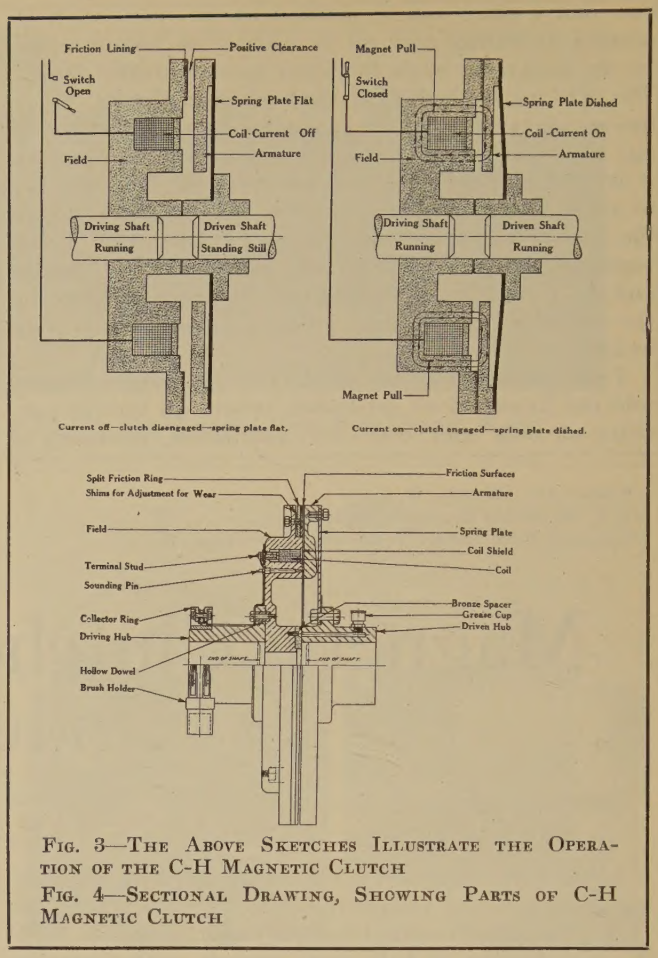


Fig. 3—The Above Sketches Illustrate the Operation of the C-H Magnetic Clutch

Fig. 4—Sectional Drawing, Showing Parts of C-H Magnetic Clutch

Motor speeds usually vary between 120 and 240 r. p. m., although occasionally motors at speeds as high as 600 r. p. m. are employed. In the latter case, clutches should not be selected entirely on a torque basis, but, rather must be considerably oversize in order to reduce the rate of the friction lining wear.

Starting the Tube Mill

It has been found in practice that a tube mill can safely be started by closing a knife switch and connecting the clutch directly to the line, thus allowing the mill to come up to speed as quickly as the clutch permits. The results obtained by this method show that the starting period may be as short as 5 seconds, which in the opinion of some motor builders is too short a period to be considered good practice. Time, however, in this case is not a measure of safety to the machinery, since it is only a question of forces imposed on the various sections of the unit. The clutch torque transmitting capacity being limited to 2 or 2.5 times the motor torque, it is plain that the forces transmitted cannot exceed the allowable forces figured by the machine designers as safe.

Mill operators in the past have expressed a preference for a manually operated rheostat to control the excitation of the clutch during the starting period, and most of the clutches in service are equipped with starting rheostats. The type of starter used for this service is very simple, being of the same construction as a starter for a 5 h. p. direct current motor, except that a special resistor layout is used. By using a starting rheostat, the clutch torque can be regulated within limits, and the acceleration period can be extended several seconds longer than when no rheostat is used.

Other operators energize the clutch by simply closing a line switch and use no form of rheostat. From every indication no objection can be observed with this method of starting. Motor ammeter readings indicate that there is no current surge and that the peak current is well below the maximum current at which the motor would pull out of step. It should be stated, however, that the observations were made in connection with motors having a relatively high pull-out factor, whereas there are a number of motors now being used where the pull-out factor is considerably lower. It is quite possible that synchronous motors with a low pull-out factor would be pulled out of step when the magnetic clutch is connected directly to the line. Therefore, in many cases it is a wise precaution to employ a rheostat when the clutch torque capacity is considerably in excess of the motor capacity.

Gradual engagement is one of the inherent characteristics of magnetic clutches. This is because of a large electro-magnet employed, which, being highly inductive, introduces a time element in the growth of the magnetic flux, and as the clutch torque is a function of the magnetic flux, the torque also rises gradually to full value. The time required for the average size clutch used in cement mill service to come up to full value is about six seconds after the switch has been closed and full voltage impressed at the clutch terminals. During the first few seconds that the clutch is energized the torque capacity is not sufficient to start the mill and the clutch will slip. During this period the clutch is impressing upon the mill shaft a gradually increasing torque, which takes up all slack in the gears. When the clutch torque is high enough to start the mill in rotation, the pull is steady and no shock is experienced. Unlike other forms of clutches, this action does not depend on the skill of the operator.

There is one objection to the use of starting rheostats. The starter may be held in a position which does not allow sufficient current to flow through the clutch coil to start the mill. For example, consider that a compeb mill requires 150% full motor torque before it will start to turn. The starting rheostat may be held in a position so the clutch will not develop more than 125% full motor torque. Under these conditions the clutch would continue to slip and the mill would not start. The result would be unnecessary wear of the lining and heating of the clutch. When it is desired to use a rheostat the operation of which does not depend upon the skill of the operator, a full magnetic automatic starter should be used. This type of starter is operated by a magnet working against a dash pot, the timing of which may be adjusted, and cuts out the several steps of resistance successively.

One of the advantages of magnetic clutches, very much appreciated by operators, is the fact that by merely pressing one of several push buttons located around the mill, the clutch can be disengaged, thereby disconnecting the high inertia motor and bringing the mill quickly to rest.

Direct Current Required

Magnetic clutches require direct current for excitation and 110 or 220 volts is suitable. The exciter generator for the synchronous motor often serves as a source of direct current for the magnetic clutch, though frequently direct current is supplied from an outside source.

Shaft Alignment

The two shafts on which the clutch members are mounted must be kept in exact alignment, if the equipment is to run without vibration. Several methods are employed to keep the shafts in alignment. The simplest and in many ways most satisfactory method is to use a three-bearing motor base plate having the clutch mounted between two of the bearings. With this arrangement, it is a relatively easy matter to maintain the shaft in correct alignment, after the installation has been made on a solid foundation. Most of the synchronous motors now in service are of the two-bearing type. There is no possible objection to this arrangement, except that it is necessary to check the shaft alignment more frequently than when a three-bearing base plate is used. Flexible couplings, both in combination with the magnetic clutch and separate from it, are used with the standard two-bearing motors and the three-bearing motors. Flexible couplings give a measure of relief from shaft misalignment and are preferred by some operators while others consider them an additional complication.

The problems entering into the design and application of clutches to cement mill services are more of a mechanical than an electrical nature, that is, the greatest problem is to build a clutch which will give years of continuous and reliable service, under the conditions encountered in practice. Magnetic clutches have an advantage over clutches of any other type because the force required for the operation is developed within the clutch structure itself, instead of being transmitted from an outside source by means of sliding collars, toggles, etc. It is, therefore, the simplicity of the mechanical design which is one of the most pronounced features of the magnetic clutch. It is, of course, highly desirable to use a clutch which may be operated simply by closing a switch, as contrasted with a mechanical clutch which may require one or several men to engage it. Reliable operation is, however, the greatest demand.

Portland Cement Output in May

The statistics shown in the fallowing table, prepared under the direction of G. F. Loughlin, of the United States Geological Survey, are based mainly on reports of producers of portland cement, but in part on estimates. The estimates for May were made necessary by the lack of returns from three producers.

Production, Shipments, and Stocks of Finished Portland Cement in May, 1922, and Preceding Months

Month	Production (bbls.)		Shipments (bbls.)		Stocks at end of month (bbls.)	
	1921	1922	1921	1922	1921	1922
Jan.	4,098,000	a4,291,000	2,539,000	a2,931,000	10,300,000	a13,316,000
Feb.	4,379,000	4,278,000	3,331,000	3,285,000	11,400,000	a14,142,000
Mar.	6,763,000	6,685,000	6,221,000	7,002,000	12,000,000	a13,848,000
1st quar.	15,240,000	15,254,000	12,091,000	13,218,000	.....	.....
Apr.	8,651,000	9,243,000	7,919,000	8,592,000	12,600,000	a14,470,000
May	9,281,000	11,176,000	9,488,000	12,749,000	12,450,000	12,897,000
June	9,296,000	.....	10,577,000	.....	11,150,000	.....
2d quar.	27,228,000	.....	27,984,000	.....	.....	.....
July	9,568,000	.....	10,301,000	.....	10,414,000	.....
Aug.	10,244,000	.....	12,340,000	.....	8,280,000	.....
Sept.	10,027,000	.....	11,329,000	.....	6,953,000	.....
3d quar.	29,839,000	.....	33,970,000	.....	.....	.....
Oct.	10,506,000	.....	12,114,000	.....	5,348,000	.....
Nov.	8,921,000	.....	5,195,000	.....	9,091,000	.....
Dec.	6,559,000	.....	3,697,000	.....	11,938,000	.....
4th quar.	25,986,000	.....	21,006,000	.....	.....	.....
	98,293,000	.....	95,051,000	.....	.....	.....

a—Revised.

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that the imports of hydraulic cement in April amounted to 10,855 bbls., valued at $26,134. The total imports in 1921 amounted to 122,317 bbls., valued at $388,828. The imports in April were, from Canada, 10,024 bbls.; Japan, 713 bbls.; other countries, 118 bbls. The imports were received in Porto Rico, 10,121 bbls.; Hawaii, 713 bbls.; San Francisco, 16 bbls.; Vermont, 3 bbls.; and Philadelphia, 2 bbls.

The exports of hydraulic cement in April were 75,412 bbls., valued at $216,073. Of this total, 74,441 bbls., valued at $212,946, was portland cement, which was sent to Cuba, 37,649 bbls.; the other West Indies, 4,482 bbls.; South America, 16,886 bbls.; Central America, 6,233 bbls.; Mexico, 4,883 bbls.; Canada, 2,878 bbls.; other countries, 1,430 bbls. The total exports of hydraulic cement in 1921 were 1,181,014 bbls., valued at $4,276,986.

The statistics of imports and exports of hydraulic cement in May are not available.

Imports and Exports of Hydraulic Cement in April, 1922, and Preceding Months

Month	Imports (bbls.)		Exports (bbls.)	
	1921	1922	1921	1922
January	14,698	17,036	225,561	70,725
February	18,269	5,157	84,230	82,421
March	7,631	1,597	97,302	103,556
April	1,540	10,855	93,009	75,412
May	2,035	(b)	82,409	(b)
June	1,657	.....	100,831	.....
July	3,455	.....	81,091	.....
August	10,988	.....	84,538	.....
September	5,177	.....	84,668	.....
October	11,448	.....	79,871	.....
November	20,112	.....	71,214	.....
December	25,327	.....	96,290	.....
	122,317	.....	1,181,014	.....

(a) Compiled from records of the Bureau of Foreign and Domestic Commerce.
(b) Imports and exports in May are not available.

Lime Association Convention Covers Interesting Subjects in Lime Industry

The fourth annual convention of the National Lime Association and the twentieth annual meeting of lime manufacturers was held in Cleveland, Ohio, on June 13, 14, 15, and 16. A spirit of optimism prevailed among those in attendance. An attendance of well over 100 was made up of manufacturers of lime and others connected with the lime industry from the territory included between the east coast and as far west as Denver. The southern states were well represented.

Tuesday was devoted to bureau staff conference, a joint meeting of members of the staff of the central office of the association, and of the several regional bureaus. Information was exchanged about the work in hand, with a view to laying a better basis for cooperation and proposing new lines of work that promise to be helpful to the lime industry.

While considerable time was devoted to discussion of problems dealing with kiln efficiency and plant operation problems, discussions during the last two days of the convention were mainly based upon problems in the extension of the use of lime in the construction, chemical and agricultural fields. Among the problems mentioned in regard to lime plant operation were included questions as to how many of the difficulties with the properties of commercial lime are due to imperfect burning, and whether this is inherent in the draw kilns; the effect of over-burning of calcium lime on its rate of slaking; the effect of the size of the stone used upon the fuel efficient of the kiln, and the effect of the rate of heating of the stone, upon the properties of the lime; the action of forced draft on the operation of a kiln and production of lime per ton of coal. Other lime plant operation problems mentioned were relative to the storage and handling of quick lime and hydrated lime, particularly in regard to the most effective type of storage for quicklime, and amount of hydration of quicklime in the car.

The Wednesday session was started by roll call, and after opening remarks by President Charles Warner, the program as announced was carried out with few changes.

A paper on the new plant of the Rockland and Rockport Lime Co., was read by Nathan C. Rockwood, and illustrations in the form of lantern slides showed the interesting points in the plant.

"Lime Burning in Rotary Kilns" was the subject of an interesting talk by Irving Warner, who has recently become general manager of the American Lime and Stone Co.

The symposium on lime for chemical industries covered problems of the chemical users of lime. "Sulphite Paper Pulp" was the subject covered in a paper by P. A. Paulson, consulting engineer, Appleton, Wis. In outlining the use of lime in the paper industry, reference was made to the difference in results when using straight calcium lime and high magnesium lime, the use of straight calcium lime resulting a harsh, hard transparent pulp, with as high as 8% of screenings as compared with 2% to 3% when high magnesium lime was used. A well burned lime, free from impurities and containing a high percentage of magnesium, is apparently most suited to the sulphate paper industry.

Other industries covered were: "Glass Industry," by R. P. Shiveley, Monongah Glass Co., consulting glass chemists; "Soda and Sulphate Paper Pulp Industry," by G. K. Spence, chief chemist, New York and Pennsylvania Paper Co., Johnsonburg, Pa.; "Water Softening," by S. C. Hadden, editor of *Municipal and County Engineering*, Indianapolis, Ind.

In the glass industry it was cited that limestone, quicklime and hydrated lime are all used. The choice depends upon the individual experience and preference of the glass manufacturers. The processes of using lime in the soda and sulphate paper pulp industry were explained and recommendations made for overcoming the difficulties met with by cooperation between the lime producer and the user.

An address of welcome, following the noon luncheon, was made by Hon. Newton D. Baker, former Secretary of War, president of the Cleveland Chamber of Commerce. "Bureau of Mines Assistance to the Lime Producers" was the subject of a paper read by Oliver Bowles, Mineral Technologist, United States Bureau of Mines. The paper is presented in full elsewhere in this issue.

The continuation of the symposium on lime for chemical industries on Thursday included a paper by Prof. Elton R. Darling, of James Milliken University, on lime in the textile industry. President Warner cited in conclusion that the potential possibilities of lime in the chemical field were not fully realized and developed by the National Lime Association.

In a brief talk J. H. McNamara explained a new type of lime barrel and demonstrated its use. The new barrels are made of metal, weigh 11 lbs. each and are in three pieces. They are collapsible, allowing easy return shipment. The idea was suggested that arrangements could be made whereby the lime producers could all buy the barrels ready stamped at a central point, thus getting them at a minimum cost.

In discussing the "Mechanical Handling of Lime," H. D. Pratt, of the Link-Belt Co., Philadelphia, Pa., described and illustrated with lantern slides several mechanical installations and conveying systems which have been found to effect savings of as high as $50.00 per day over the cost of handling by the methods replaced.

The symposium on lime in construction was led by W. E. Emley, in charge of lime investigations, United States Bureau of Standards. The effect of the addition of hydrated lime to concrete, as determined by tests made at the Bureau, was discussed. The effect of the hydrated lime was considered apart from the effect of

the additional water, and the conclusion drawn that the addition of small percentages of hydrated lime did not tend to decrease the strength of the concrete, but increased its workability, while the addition of water decreased the strength. While the results of the tests made by Mr. Emley agreed closely with the results of the experiments made by Duff A. Abrams, of the Structural Research Laboratory, Lewis Institute, Mr. Emley's conclusions do not coincide with Prof. Abram's conclusions. Professor H. C. Barry, University of Pennsylvania, outlined the work which is being done in his department in the University.

Miss Mary Squire, president and general manager of the Allwood Lime Co., Manitowoc, Wis., told in a very interesting talk her experience in successfully producing a special product and supplying the markets of the United States, Canada and England with lime for steel ball finishing, when the German imported lime had been used up. The chemists were termed by Miss Squire "the very foundation stones of the lime business." She has demonstrated that if a product is honestly the best for any specific use, the buyer will go to the plant for it.

"Lime in Crop Protection" was the subject of a paper read by W. C. O'Kane, New Hampshire Agricultural College, describing the various uses to which lime can be put in counteracting the agencies destructive to crops.

"How to Handle the Day's Work" was the topic of the Thursday luncheon talk by H. Elmo Martin, efficiency expert, Cleveland. Mr. Martin's talk was one of the high lights of the convention, and while it did not apply to the lime industry in general, the principles outlined were general and parallels were drawn, showing how officials could increase their own efficiency and the efficiency of others throughout their organization.

The afternoon and evening of the 15th were given over to a general good time and supper on the shore of Lake Erie, arranged by the Ohio members of the Association, and the Valve Bag Co. of America.

The last day of the convention was opened by a paper, "Bearing of the Work of the Chemical Department on the Larger Use of Lime in the Chemical Field," by Dr. M. E. Holmes, manager of the chemical department. Dr. Holmes referred to the cooperative research in burning different limestones and adaptation of resultant limes to various uses. The chemical field was referred to as an extensive one, the surface having only been scratched, since lime finds its way into only about 1% of the possible uses. Speaking on "What I Have Found Out About Lime," F. C. Mathers, Professor of Inorganic Chemistry, University of Indiana, outlined some of the results of his experiments, with demonstrations, and cited possible practical applications for the principles involved, in the various industries where lime is used in chemical processes.

An interesting paper was read by E. R. Weidlein of Mellon Institute, Pittsburgh, Pa., on "The Value of Research to Industrial Associations." It was cited that Europe is sending groups of men to America to study the cooperation between science and industry, with particular reference to activities of chemists.

A very valuable paper from the standpoint of all interested in trade associations was read by O. B. Towne, secretary, Waxed Paper Manufacturers Association, New York City, on "The Bones and Sinew of Association Work." The trade association idea was referred to as the principle of cooperative progress. In reference to the activities of trade associations it was cited that the intent determines whether an act is a crime or not.

J. A. Slipher, manager agricultural department, read a paper on the use of lime in agriculture, followed by "The High Points in the Construction Department Program of Lime Promotion," by W. A. Freret, manager, construction department.

Following the complimentary luncheon on Friday, George A. Coulton, vice-president of the Union Trust Co., Cleveland, spoke on "Trade Winds in Business." An accurate cross-section of present business conditions was outlined as obtained from leaders in the industries. After the convention photograph, members of the Association convened for a business session to take up routine work and for election of officers.

Officers for the coming year will be: President, Charles Warner; vice-president, George C. Nicholson; secretary-manager, W. R. Phillips; treasurer, Milton McDermott. Mr. McDermott is a new officer, and Mr. Phillips succeeds E. O. Fippin.

Hermitage Cement Co. Progressing

Location of a $1,500,000 cement manufacturing plant at Old Hickory has been announced by officials of the Nashville Industrial Corporation and the Hermitage Portland Cement Co.

Contracts for the construction of the plant and the opening of the quarry will be let before July 1, and the plant will be manufacturing cement by January 1, 1923, according to reports from Nashville. The capacity will be 2,000 bbls. a day, or 600,000 bbls. a year. The entire output will be sold through T. L. Herbert & Sons, of Nashville.

Officers of the company, which is incorporated under the laws of the state of Delaware, are John C. Vance, president; T. L. Herbert, Jr., vice-president; and R. T. Miller, secretary-treasurer. Mr. Vance is the president of the John C. Vance Iron & Steel Co. of Chattanooga. Mr. Herbert is a large dealer in building supplies here. Mr. Miller is the president of the United States Testing Laboratory of Chicago. The directors of the company are Mr. Vance, Mr. Herbert, S. S. Price, capitalist, of Chattanooga; M. C. Monday, contractor, of Knoxville; and R. A. Ellis, of David Evans & Co., pig iron factors, of Chicago.

The Hermitage Portland Cement Co.'s engineers have estimated that a plant of 2,000 bbls. per day capacity can be put into operation on this property at a cost of less than $2 per barrel for the first year's output, including purchase price of land, buildings, machinery and all other expenses. This exceptionally low cost is made possible by the favorable basis on which the prpoerty was secured from the owners of the Old Hickory powder plant, and the further fact that it will not be necessary to build a power plant, as very advantageous rates have been secured from the Tennessee Power Co. for all the power that the cement company will use.

As compared with the time which would be required to build a cement plant from the ground up, a saving of at least six months will be effected because of the adaptability of the buildings and equipment which the company has purchased. It will be unnecessary for the company to expend money for housing employees, ice plant, recreation centers, and water rectification, as all these conveniences now exist at Old Hickory, and are at the service of all the population of that growing industrial community.

Use of Slip-Ring Induction Motors and Synchronous Motors in Cement Mills[1]

By H. W. Rogers
Engineering Department, General Electric Co.
Schenectady, N. Y.

Cement mill machinery lends itself very readily to motor application, and while there are several direct-current motor installations, the majority of mills is driven by alternating-current induction motors.

Cement is a fine abrasive dust and the atmosphere in a cement mill is usually heavily laden with it. As it settles on everything, the natural tendency is to discriminate against the use of direct current motors owing to the possibility of commutator trouble, but the operation of direct-current motors in mills that are so equipped does not entirely justify this attitude. There are, however, many advantages in favor of the alternatnig current motor, and since there are but one or two instances where variable speed is desired on any of the machines, the induction motor is preferable, not only from the standpoint of power transmission and cost, but because there are, in most cases, no open contacts to invite trouble due to the accumulation of dust.

With the exception of the kiln and tube mill, the starting conditions are not severe and squirrel cage induction motors are always recommended, although in foreign countries there is a strong tendency to use slip-ring motors, even in small sizes, owing to the lower starting current and small line disturbances. Even in the case of the kiln, the starting conditions are not severe, but the desire for speed variation makes it necessary to use slip-ring motors. The tube mill, however, requires from 120% to 130% normal torque in starting, and although the squirrel cage induction motors have been used very extensively for this service up to 200 h. p. capacity, it has always been the practice to use a high voltage compensator tap or throw them direct on the line with full voltage. This practice is not injurious to the motor, but may be objectionable when the capacity of the power station is limited, or where chain drive is used, as the bolt at starting introduces severe strains. It also has a tendency to crystallize the driving shaft on the tube mill, resulting in breakage and ultimate replacement.

There is, therefore, a reasonable objection in using slip ring motors on tube mills, and it has become more necessary during the last few years with the development of the compeb mill, which requires motors of as large as 500 h. p. capacity.

It has been the practice always to use enclosed collector rings wherever slip-ring motors were used, due to a mistaken idea that this was essential to successful operation. The fine cement dust, although very abrasive, does not materially affect the rings or the brush contact, and the only possible source of trouble is due to a collection of dust between the brushes and the holder, causing the brush to stick. This trouble is remote, and with the proper design of brush holder, and proper brush tension it may be entirely eliminated.

Most cement mills are equipped with compressed air, which should be used at least once a week for cleaning the dust from the air ducts of the motors, and there is a strong preference on the part of a number of cement mill operators to use this means of keeping the collector rings clean, rather than resort to enclosed collectors, which are invisible and inaccessible.

There are certain features in the design of enclosed collectors, especially in connection with the larger low-speed motors, which are not only expensive but undesirable, and it seems unnecessary to resort to this practice longer.

Until recent years synchronous motors have not been used in the industry, but there is a growing tendency toward their application to the tube mill, which is a steady load of large enough proportions to improve materially the power factor of the whole system.

Until the compeb mill was developed, 200 h. p. was about the largest capacity used, and generally the motors were squirrel-cage, either started from a high tap or thrown directly on the line, but with the advent of the compeb mill, especially in the larger sizes, motors as large as 500 h. p. became common.

The tube mill, owing to its construction, is inherently a heavy-starting duty machine, and tests have shown that from 120% to 130% normal starting torque is required to meet the conditions.

The use of synchronous motors, therefore, requires that they be brought up to synchronism before applying the load, as such heavy starting torques are not available on a motor of good design, unless it is also used for furnishing a heavy reactive current and is much larger than is actually required for the mechanical load.

It becomes necessary therefore to use a clutch of some approved design to permit of starting without load. Both mechanically operated and magnetic friction clutches have been used with entire success. In general, motors of this type are direct connected to the back shaft on the tube mill through the clutch, and operate from 160 to 180 r. p. m. A motor of three-bearing construction or equivalent design may be used with the clutch mounted between the motor bearing and the out-board bearing, but a fourth bearing is sometimes required, depending on the type of clutch used, and this is usually one of the bearings on the back shaft of the tube mill.

Where magnetic clutches are used it is desirable to have all three bearings mounted on a common iron base, to preserve alignment, but such construction is not necessarily required. The iron base may be omitted and the out-board bearing mounted on a concrete foundation.

[1]From *Journal, American Institute of Electrical Engineers.*

Bureau of Mines Assistance to the Lime Producer[1]

By O. Bowles
Mineral Technologist
United States Bureau of Mines

The National Lime Association, through its Washington office, has urged the desirability of active cooperation between the Bureau and the Association in safety problems as well as in matters of efficiency in equipment and methods of operation. Therefore, the Bureau has undertaken a study of quarry conditions and operations and in the performance of this duty I hope to visit many of our quarries during the present year. It is desirable, therefore, to point out in a general way the aims and purposes that the Bureau has in view in undertaking such work, for thereby I hope to establish a cordial spirit of cooperation that will not only make the work of the Bureau easy, but will also result in the greatest benefit to the lime industry.

The Bureau of Mines is interpreted in the minds of many people as an organization that has to do largely with the problems in metals, coal and petroleum. Its activities in the field of such common ordinary rocks as limestone may be underestimated, and it is to inform you concerning the Bureau's past, present and proposed work in quarry problems that I am here today.

In the first place, I wish to make it clear that I am in no sense an inspector who makes reports of your operations. Any notes or records that I may make are for my own personal use in compiling a general report.

A second point I wish to emphasize is that when I have entered your quarry where you have worked and studied out your problems for perhaps 30 years, I do not presume to make a half-hour inspection and then try to tell you where you are all wrong. I realize the complexities of quarries, for I have found through observation that limestone deposits are somewhat like people, in that no two of them are exactly alike, and that they must all be handled differently.

These are some of the things I shall not do. But what is it that I can do that will be constructive and beneficial? One important office of the Bureau of Mines in this field is to act as a clearing house for information. During the past ten years I have visited between 400 and 500 stone quarries, noted the properties and peculiarities of the rocks, and the methods employed to remove the stone from the present ledge. It is a remarkable fact that on practically every one of them something new appears, some features not observed elsewhere. Nature exhibits endless variety in the properties and structure of its rocks, and human ingenuity has devised a multitude of methods and machines for handling rock. It must be admitted that nature has in many instances features such as clay seams and pockets, siliceous or otherwise impure bands or nodules that make the quarryman's work very difficult. It is an unfortunate fact, however, that all the faults are not confined to nature, for human devices as observed in many quarries are very defective and inadequate.

It is readily apparent, therefore, that anyone with ordinary intelligence and capacity to observe and interpret, must of necessity amass a wealth of information during the process of making a careful study of several hundred quarries. It is this fund of information that I wish to present in some form to the members of the National Lime Association. My work is not, therefore, that of an inventor or an impractical idealist, who goes about the country urging new and untried methods, but is rather that of an observing and judicious onlooker who tries to carefully weigh and classify all methods of operation, to approve and encourage those that are meritorious and to discourage those that seem to bring nothing but inefficiency and loss.

I realize that many of you have had the opportunity to travel about the country and that you are familiar with operations in quarries other than your own. Furthermore, your National Lime Association at such conventions as this provides a means of discussing problems and exchanging ideas. Thus you are enabled to utilize the best types of operation known in the lime industry. But the Bureau of Mines can widen this field. Limestone is used for many purposes other than for lime manufacturing, and in some branches quarry problems are very similar. You may not be familiar with methods employed in the cement industry, in the fluxing limestone industry, or in quarries devoted exclusively to concrete aggregate or road material production. Are there any developments in these branches that might be applied with profit to your industries? I have visited about 70 large quarries where cement materials are produced and it may be that many devices there employed—devices that have been proved practical and efficient—could be applied with equal benefit to quarries where the raw materials of lime are produced. It is possible that I may have something to suggest to you during the time of my visit at your quarries, but for the most part my purpose is to obtain as complete information as possible and to compile this information in the form of a report that you may have before you for future reference or study. It is intended that such a report shall contain information as to the best quarry practice known, as well as to point out the pitfalls that should be avoided.

I wish to warn you that I have a keen desire for information. In order that I may give out that which will benefit you most, I must first receive full information. In this connection I beg to assure you that any information supplied will be regarded as confidential if so desired. In my report I try to avoid as far as possible the names of operators or exact location. Such information is mere gossip and has no direct bearing on the facts. Definite information is, however, essential in arriving at general conclusions. Wherever possible I obtain exact cost figures, for such figures are of inestimable value. Two weeks ago I obtained a definite figure for the cost of producing in a large limestone quarry. The name and location of this operation, even if I were free to give it to you, would be of little benefit, but an outline of the quarry conditions would be of real use. As an illustration of this type of service, let me give the conditions and the production cost. The quarry face is 180 to 245 ft. high; a shelf quarry; automatic drainage; rocks in open beds 2 to 6 ft. thick, dipping about 60 degrees; overburden averages 3 ft., but many deep pockets of clay make it difficult and expensive to strip; churn drill blasting single bench; full height of face holes, with 45 ft. overburden; 20 ft. spacing; hand loading of rock to 2½-ton cars; hauled by locomotive to incline in cars for fluxing purposes; 73.2c per ton, including overhead. Such a statement betrays no confidence and pre-

[1]Published by permission of the Director of the Bureau of Mines. A paper read at the Fourth Annual Convention of the National Lime Association, June, 1922.

sents concrete facts in which you are all interested. It gives a figure for comparisons. Are my quarry conditions similar to these; must I add pumping costs or a heavy stripping cost? If my conditions are similar, and my costs are $1.50 per ton, then I have something to learn; if conditions are similar and my cost only 50c a ton, then I may feel a certain degree of satisfaction, knowing that the other fellow has something to learn.

I trust, therefore, that you will feel sufficient confidence in the Bureau of Mines to impart data that are essential as a basis for constructive work—I am not insistent in the matter. My appetite for data is governed largely by your cordiality, but I feel that the Bureau will be of real benefit to you just in proportion that you utilize it by working with it. No matter how perfect a rock crushing outfit you may have, if it is left standing on your sidetracks it brings no money to you, but if you mount it on a concrete base, connect it up properly, and feed stone to it, you get a return for your money. The Bureau of Mines is a piece of machinery that stands ready to serve you. If you cordially cooperate with it, it will undoubtedly yield you a profit.

British Cement Industry Decreased in 1921

By Irvin D. Foos

British cement and concrete industry in 1921 suffered from difficulties akin to those experienced by the industry in the United States and the world-wide industrial and trade depression. In the early part of the year the demand for cement was fairly good both in the British domestic and export markets, although somewhat less than in 1920. As the year advanced the export trade began to fall off and the home demand soon followed suit.

British manufacturers entertain the opinion, however, that a substantial improvement will be manifest this year owing to the large amount of structural work known to be in contemplation as well as to the progressive reduction in the cost of cement. Meanwhile manufacturers have been improving their plants and modernizing works and in several instances have carried out extensions for the purpose of increasing the capacity of their output.

Reduction in the British exports of cement last year was caused by the adverse conditions affecting most industries. Structural work which has been actively carried on all over the world since the armistice, created a very large demand for cement, and at first most kinds of work could be financed without apparent difficulty. The serious fall in the value of commodities exported from the principal cement-buying countries and the adverse rate of exchange had the effect of making it impossible for buyers to finance their shipments of cement.

British exports to Argentina and Brazil fell almost to zero and shipments generally represented less than half of those made in 1920. British manufacturers endeavored to meet the situation by substantial reductions in price and were materially assisted by the reduction of shipping rates. Unfortunately for the British manufacturers these favorable developments resulted in little benefit because of competition from continental European manufacturers.

Among the latter, German manufacturers particularly were active, and aided by their greatly depreciated currency found themselves in a position that enabled them to undersell British manufacturers to an extent which made the business of the latter very difficult if not altogether impossible. Notwithstanding these circumstances, large quantities of cement were exported and the industry as a whole succeeded in its efforts to retain a hold on the world's markets.

Home consumption of British cement was reduced by insistent demands for economy in government and municipal expenditures. The progress of housing construction in Great Britain, which in 1920 seemed likely to absorb enormous quantities of cement, was checked considerably. Many schemes were abandoned and others greatly reduced by the authorities. The price of British cement has fallen about 17% below the maximum rate and it is probable that further reductions will follow as the cost of labor and fuel fall.

The manufacturers had to put up with greatly reduced profits during the year. The coal strike put most of the mills out of commission and those in operation were able to keep going only by the aid of foreign coal declared to be of very poor quality purchased at high prices. Many mills suffered an actual loss during the first six months of the year, but results were more favorable for the second half. The foregoing review summarizes briefly the numerous companies constituting the Associated Portland Cement Manufacturers, Ltd., and the British Portland Cement Manufacturers, Ltd., the mills of the firms in question being situated in all the cement producing areas of the United Kingdom.

Lime Burning in New Brunswick Increased

By W. J. McNulty

The lime kilns at the Charles Miller mill, on the Pokiok road near St. John, N. B., are believed to be the oldest kilns in Canada, if not in North America. They were built 70 years ago. Of late years they have fallen somewhat into disrepair. The kilns across the river from the Charles Miller kilns, at the Randolph and Baker mill on the St. John river, are also old kilns. They have been in operation for the past 60 years.

At Green Head, near St. John, which is a little south of the Randolph and Baker property, 60 years ago the most flourishing lime business in eastern Canada was operated. It consisted of six kilns. Now the kilns have fallen into disrepute. They have not been in use for the past 20 years.

The biggest drawback to the lime manufacturing trade that has faced most of the lime manufacturers in the past, namely, that of transportation, does not worry the owners of the new kilns at Brookville, five miles from St. John. The Brookville kilns are located on the railroad line and a spur track has been built to the kilns. The Charles Miller kilns are six miles from the railroad line, and the roads are very hilly, which makes matters worse. The Randolph and Baker mills are four miles from the railroad line, also over hilly roads. The Stetson-Cutler Co.'s kilns are four miles from the railroad line.

There is talk of a cement factory being started in eastern Canada, near either St. John or Halifax. The Canada Cement Co. is reported to be considering the building of such a factory, to cater to the eastern Canadian trade. One of the American independent companies is also reported to be looking over the ground in eastern Canada, with the intention of starting a factory for the manufacturing of cement.

Apprehension Regarding Belgian Cement Plants

By E. Lee Heidenreich

Some of the Belgian cement plants remind one of the saying: "As the wheat is sprouting the weeds are blossoming."

A meeting of the "Cimenteries d'Antoing" concluded with the forced resignation of the directors.

By a similar meeting of the "Union Belge des chaux et Ciment" the feeling ran very high, and in the immediate future will appear publicly several disagreeable matters on the subject of squandered fortunes.

The "Cimenteriese Marchienne-au-Pont et Halenzy" had for the only point of order at its last meeting the subject of dissolution.

These three cement plants pertain to a group, against which the Belgian press repeatedly has issued warnings.

"Cimenteries d'Orp-le-Grand" closed the year 1921 with a capital of 1,000,000 francs and a loss of 343,491.83 francs.

From other reports, as well everything points to the fact that the often criticized cheap Belgian cement prices are not based upon self-sustaining business methods.

On the annual meeting of the "Ciments de Thieu" the president declared that the fiscal year had been without profit or loss. The several changes and additions to constructions, however, have advanced far enough so that the business shortly may be resumed in full force.

Messrs. Justin Alandin and Joseph Dierick were appointed liquidators for the group of "Ciments de Raevels," "Usines d'Armingnies," "Portland Liegeois," "Meuse Brabant," "Niel on Rupell," "Usines Levie," "Nortlir Bonne Esperance a Turnhout."

The Ignition Temperature of Coal

Under ordinary conditions the ignition temperature of a fuel is less important than the maintenance of combustion. No matter how large the mass of fuel may be, whether it is in a blast furnace, under a boiler, or in ordinary household furnace, the origin of the heat necessary to raise this fuel to the ignition temperature is in the kindling which starts the fire. Hence the starting of an ordinary fire is a process depending upon the application of an outside source of heat, always at a high temperature, to some portion of the mass of coal until a part of the coal itself burns and propagates heat to the remainder.

It is, however, in connection with the storing of coal in piles that the ignition temperatures takes on a real significance. Coal is actually burning at all times, and even at low temperatures. If the heat thus produced is sufficiently confined and air is supplied to the coal at the proper rate, the temperature of the interior of the mass will rise. As the temperature rises the rate of combustion also rises, and after a certain safe temperature is passed the process goes on quite rapidly until burning or flame results. Bulletin No. 128 of the Engineering Experiment Station of the University of Illinois, "The Ignition Temperature of Coal," by R. W. Arms, makes a study of this problem, with the object of determining the influence of the temperature of ignition of the various coals upon the liability to fire while in storage. In this bulletin is given a discussion of what point may actually be designated as the ignition temperature ,and what factors influence that point, the methods for determining the ignition temperature of different coals, and the results of tests upon the various coals used in this investigation.

The following summary is given at the conclusion of the bulletin:

(1) The "ignition temperature" of coal means nothing unless it is applied to some definite point in the process of heating the coal, which can easily be determined and duplicated.

(2) The temperature at which the coal glows seems to be the most logical point to choose as the ignition temperature. It is easily observed, can be duplicated with a fair degree of accuracy, and marks the beginning of visible combustion.

(3) The glow point is probably affected by the oxygen content of the coal, and perhaps by other agencies made active by weathering.

(4) The glow point is not affected by ash, moisture, size of particles, slight variotions from the normal air supply, or rate of heating.

(5) There is no indication at present that the glow point bears any direct relation to the liability to fire while in storage. Perhaps if a series of tests were made on the glow points of freshly mined coal new information would be brought to light which would lead to the discovery of some more definite relation between glow point and the firing qualities of the coal.

Copies of Bulletin No. 128 may be had without charge by addressing the Engineering Experiment Station, Urbana, Illinois.

Cement Produced in Finland

There are two important cement mills in Finland, both of which manufacture first-class cement, according to a report to the Department of Commerce from Consul Leslie A. Davis, at Helsingfors. There has been a lack of cement in that country, however, during recent years, because of the insufficiency of coal needed by the industry. Both of the mills closed down two months last summer, because of the English coalstrike, with the result that there was a deficiency in production of 100,000 bbls. of cement. In spite of this only 20,000 bbls. were imported. Production of the Finnish mills totaled 400,000 bbls. last year.

It is expected that the domestic production will increase in the near future. Work is just being completed at Pargas, Finland, on another cement oven, reports Consul Davis. The quarrying of limestone, with a production of about 800 tons per day, requires modern power-driven apparatus for transporting and crushing the material. The power of the station has been increased two-fold and the new cement oven, with all the necessary machinery, has been installed. It is hoped that all work will be completed by next May, and that the new oven then can be put in operation, thereby doubling present production.

The production of the Pargas company alone will then be nearly 70,000 bbls. per month, and that of the two domestic factories together about 1,000,000 bbls. per annum, which is more than is required in Finland at present. Exportation would enable the mills to obtain foreign money with which to purchase the coal required, but exports are hampered by the customs duties imposed by different countries. Large quantities of cement, to the value of several millions of Finnish marks, were exported from Pargas to Sweden in 1921, although the duty is reported to have been more than 10 marks per barrel. The duties levied in several countries are so high as to make Finnish exports impossible.

Heat Balance in Cement Clinker

A Letter from C. E. Burgoon

The writer recently reviewed the article on "The Thermal Efficiency of a Rotary Cement Kiln," by the late Dr. Joseph W. Richards, which appeared in the March, 1904, issue of *Cement*, and found an error in the computations which changes the radiation into a negative quantity in the Recapitulation or Heat Balance. The error is in the determination of the heat required to dissociate the Calcium Carbonate, namely: 180.8 kilograms of carbon dioxide liberated times 990 carlories per kilogram is given as 17,896 calories, whereas it should be 178,992 calories. This correction gives heat required to dissociate the carbonates as 182,724 calories instead of 21,628 calories.

The recapitulation as given in the original article and as corrected are as follows:

Heat Generated:	Calories Per Article	Corrected
Theoretical heating power of the coal	790,000	790,000
Heat of combination of the ingredients forming the clinker	142,819	142,819
Totals	932,819	932,819
Heat Distribution:		
Heat in the hot clinker	100,050	100,050
Heat in the chimney gases:		
In the excess air	336,000	
In the necessary products	340,000	676,000	676,000
Heat in the flue dust	2,112	2,112
Loss by imperfect combustion	12,248	12,248
Evaporation of water in the charge	1,446	1,446
Expulsion of carbon dioxide from the carbonates	21,628	182,724
Loss by radiation and conduction	119,335	—41,963
Totals	932,819	932,819

The other items of the heat distribution were checked with the view of finding another error which would counterbalance the error in the heat of dissociation, but they appeared to be correct. The article does not explain the methods used in collecting the gas samples and determining the coal consumed per barrel of clinker, and without knowing positively how this part of the test was conducted, the writer is of the opinion that the kiln was not operating under balanced conditions, that is, at the time of collecting the gas samples, the amounts of raw mix, coal and air entering the kiln were not averages.

The experiments of Rapier R. Coghlan which were described on page 40 of the Cement Mill Section of Concrete for March, 1920, indicates that the calcined mix begins to fuse at about 1,300° C. and, therefore, it appears impossible to burn cement clinker with a maximum flame temperature of 1,000° C., as calculated by Dr. Richards. Furthermore, if the maximum flame temperature is 1,000° C. for the fuel and excess air used, the actual temperature in the kiln would be less, because part of the heat of combustion would be consumed by the dissociation of the carbonates, to heat the calcined mix and to supply radiation. This also indicates that the kiln was not operating under balanced conditions.

The above error has no doubt been called to the attention of cement engineers, but since the article is still referred to as giving a correct heat balance in a rotary kiln, the error should be printed now for the information of those concerned.

The Governor of the State of Santa Catharina, Brazil, has received word from the superintendente of the municipality of Itajahy to the effect that he has organized a company for the manufacture of cement from raw materials of the municipal districts of Itajahy and Camboriu, according to a report from Assistant Trade Commissioner Bernard H. Noll.

Imports of Cement Into Brazil

Owing to the present exchange situation, German and Belgian cement is much cheaper in Brazil than American or British, which is meeting considerable competition, according to a report issued by the Department of Commerce.

During the first ten months of last year Brazil imported 70,883 tons of cement from the United States, and 40,417 tons from England. The following table of this commodity for the years 1913 and 1919 and for nine months of 1920 is furnished by Consul General Haeberle:

From	Tons 1913	Tons 1919	Tons 1920
United States	50,624	106,399	56,610
Belgium	60,216	.....	8,163
Germany	188,806	565	150
England	130,367	54,135	27,890

Freight rates on cement to Rio de Janeiro are $10 per ton from the United States, 70 francs per ton from Belgium, 20 shillings from Germany, and 50 shillings per ton from England. Before the war the rates were approximately 25% lower than at present.

A Letter from W. B. Campbell

In connection with the above, some interesting facts are cited by W. B. Campbell, manager American Chamber of Commerce in Brazil, in a letter, as follows:

"Your letter with reference to the cement manufacturing plants in Brazil has been duly received. We regret the delay in replying to it, but your letter was referred to a committee for thorough report. They report as follows: 'There are only two cement manufacturing plants in Brazil, namely, Rodovalho, in the State of Sao Paulo, and Parahyba do Norte. While there is abundant material suitable for manufacturing cement, the machinery is inadequate and production very limited. A Monsieur Candlot, French cement manufacturing expert, is about to start a plant in Parahyba do Norte, with up-to-date machinery and of a production of 600,000 bbls. per year. The material to be used is the sediment of the Parahyba River.'

"Due to preferential duty, the United States has been the largest exporter of cement to Brazil; however, as the American companies have no direct representatives, and have been doing no advertising, with the keen competition, British, Swedish, and others are coming into Brazil in increasing quantities."

Bauxite Refractories

Two classes of high-alumina refractories are now on the market, according to *Mineral Resources*, 1920. What are commonly called bauxite brick are made by mixing various proportions of calcined bauxite or high-alumina clay with a bonding material such as fire clay, sodium silicate, or lime. The other class consists of refractories made by the electric fusing of bauxite. These are manufactured by the companies that make artificial abrasives.

No figures are available to show the production of high-alumina refractories, though it is known that at least 2,313 tons of bauxite was consumed in making them in 1917, 9,874 tons in 1918, and 1,059 tons in 1919. None was reported as sold to makers of refractories in 1920, though it is believed that some bauxite and high-alumina clay (dia-sporite), from the deposits in central Missouri, were used by makers of refractories.

The Advantages of Pulverized Fuel

The use of pulverized fuel is financially wise for existing as well as new plants, according to a group of engineers whose opinion has been embodied in a symposium on the costs and results of the use of pulverized fuel by the American Society of Mechanical Engineers.

The statement that the application of pulverized fuel is probably a good proposition for the new plant, but hardly worth considering for existing plants, is widely at variance with the facts as demonstrated according to H. D. Savage, of the Combustion Engineering Corp., New York City. Applications were referred to, made on existing plants, which have been found profitable to the owner from a financial and operating standpoint.

The varied considerations which warrant the change from other methods of firing to powdered fuel, include the financial proposition, which is a matter of balancing the monetary gain against the first cost and the labor turn over. These considerations also include the ability to use the fuel oil, natural gas or powdered coal in the same furnaces and with but a few minutes necessary to change from one to the other.

Powdered coal installations are so flexible in their application as to make it generally possible to employ the system with but slight change in these existing conditions. This is especially true since it is now thoroughly proven that it is not in all cases necessary to dry the coal before burning. In burning the eastern coal it will not be necessary in any case to use the dryers. This immediately does away with not only one of the most serious problems in connection with the application of powdered coal to existing plants, but with one of the largest items of expense and warrants the placing of powdered coal application in much smaller plants.

According to Mr. Savage, powdered coal can be and is being burned without drying, and the combustion results in a correctly designed furnace, using correctly designed feeders and burners will be but little different than when using dry coal.

It was the feeling of the engineers whose statements were included in the symposium, that due to the much higher continuous rating produced by powdered coal burning, present plants can be utilized for the full steam requirements at much less expense than would be necessary for additional boilers.

It was further stated in the symposium that the repairs to preparation machinery where pulverized coal has been used are not exceptive, due to their rugged construction, which reduces to a minimum the liability to break down. It is possible to burn pulverized coal at high rates of efficiency, low grades of coal that present difficulties with the average stoker.

Cement Case Off Until Fall

The Government's cases against the so-called cement trust for alleged restraint of trade will not be retried until late in the fall, according to reports from Washington, D. C., on account of congested dockets in the southern district of New York and the failure of the Government to procure a judge for the trial.

Import of Cement in Venezuela

Both Swedish and German cement was bought at a lower price than American cement in Venezuela, during the past few months.

Lehigh Valley Safety Council Urged to Prevent Waste

At the last annual meeting of the Lehigh Valley Safety Council in Allentown, W. A. Gibson, works manager of the Bradley Pulverizer Co. was re-elected president; Major H. A. Renninger, of the Lehigh Portland Cement Co., Allentown, Pa., and Joseph F. Brobston, of the Dexter Portland Cement Co., Nazareth, Pa., were re-elected vice-presidents. In attendance at this meeting were representatives of all the cement plants in the Lehigh Valley, who, in connection with the Bethlehem Steel Co., are the real backers of all Lehigh Valley safety activities.

That the two greatest evils of the present day are military warfare and industrial strife, was an interesting statement made by C. E. Knoeppel, a well known industrial engineer of New York City, who, in addressing the meeting, laid stress upon the point that the elimination of preventable waste in the industry is one of the most vital factors in the business world, and that the stabilization of production will go a long way in the direction of solving the wage problem.

Mr. Knoeppel voiced the opinion that the battles between capital and labor are inevitable, a part of the economic life, and until underlying conditions are changed there will be no progress in arriving at the causes of industrial unrest.

In further discussing the subject, some very interesting points were brought out as contained in the following abstract of his address:

The weapons of industrial warfare differ widely from the weapons of military warfare, but they are no less dangerous. On the one hand the employer uses the lockout, reduced wages, penalizing clauses and court injunctions. On the other the worker resorts to strikes, boycott, reduced production, collective bargaining, etc.

As a result there are two conclusions: when prices are higher, labor will not favor lower wages until prices come down, and when prices are low the employer will not look with favor on higher wages until prices go up. The position on both sides is logical, but with the result—an inevitable pull and haul.

The employer fears competition, depleted reserves, etc., and gives no more than he has to. The worker fears sickness, accident, death and overproduction, is suspicious and gives no more than he is compelled to. On both sides there is fear and doubt.

In the opinion of men who are leaders in advanced thought on these problems, all the elements, under present conditions, are against looking at matters on the grounds of mutual interests, and we must get back to an economic basis and real progress will be made when we realize that as a nation we must progress as rapidly economically as we have politically and scientifically.

Statistics press home the fact that preventable waste in industry, if eliminated, would provide the funds to stabilize business, and the advantages to be gained through stabilized business and through a stabilization of the sort that would distribute production over the year, and do away with the high and low peaks in various industrial lines, can be pictured.

Cement in Brazil

German and Belgian cements are gradually supplanting the American article, according to *Tonindustrzeitung* of Nov. 17, 1921. German cement is imported in large quantities at 20 Milreis per bbl., English cement at 28 to 29 Milreis and American cement at 30 Milreis.

The tariff is 15 Reis per kilogram, of which 55% must be paid in gold and 45% in paper. Belgium and the United States benefit by a reduction of 20% in the custom charges.

Men and Mills

Notes from the Field

The annual meeting of the Phoenix Portland Cement Co. was held at Nazareth, Pa., on May 10th, at the offices of the company. The following directors were elected: J. W. Walker and L. C. Morton, Philadelphia, Pa.; J. C. Parsons, Phoenixville, Pa.; C. L. McKensie, Pittsburgh, Pa.; E. P. Haubert, Nazareth, Pa.

At the board meeting, following the stockholders' meeting, the following officers were elected: Lindley C. Morton, president and general manager; J. Clarence Parsons, first vice-president; C. L. McKenzie, second vice-president; A. W. Nash, Jr., treasurer; E. P. Haubert, secretary.

W. T. Groner resigned as superintendent of the Petosky Portland Cement Co. on April 30, to accept a similar position with the Sandusky Cement Co., in the building and operating of that company's new plant near Toledo, Ohio.

Walter L. Evans has been appointed manager of the Philadelphia office of the Webster Mfg. Co., with headquarters at 719 Commercial Trust Bldg.

The Hopkinsville Lime Works, Hopkinsville, Ky., has discontinued operations, dismantled its plant, and sold tools and stock.

The transfer of the property of the Great Lakes Stone & Lime Co. at Rockport, Mich., to the Kelly Island Lime & Transport Co. marks the culmination of the deal between the Rockport company and the Kelly Island company.

The newly-acquired Rockport stone quarry and crushing plant will be put in operation as soon as possible.

E. P. Smith, head of the former owning company, the Great Lakes Stone & Lime Co., will continue to manage the plant.

The Huron Portland Cement Co. has announced that at an early date their new Huron plant No. 2, located at Alpena, Mich., will be completed, doubling their output of Huron portland cement.

The general offices of the Huron Portland Cement Co. and the Wyandotte Portland Cement Co. have been moved from 1525 Ford Bldg., Detroit, Mich., to the 13th floor, Ford Bldg., Detroit, greatly enlarging their facilities to adequately care for their growing business.

The Leadville Lime and Fluxing Co., with offices at Denver, Colo., has gone out of business permanently and disincorporated in May.

A $3,000,000 cement manufacturing plant is about to be built in Kern County, Cal., near Tehachapi, according to an announcement from Bakersfield.

W. R. Dunn, superintendent of the Vulcanite Portland Cement Co., was elected a director of the Manufacturer's Council of the state of New Jersey at the annual meeting of the body, held in Newark.

The new waste-heat boiler installation recently completed by the Asano Portland Cement Co., Japan, has been running for a month, averaging 2,150 k.w. day in and out from two 9 ft. by 200 ft. kilns. It gives the company all they need to run the plant, and about 400 k.w. in addition, which is used in the No. 1 factory.

The O'Neal's Lime Works, Inc., has announced plans for a $350,000 building which will be built in West End, Birmingham. This building will house a proposed labor bank, a motion picture theatre, a medical clinic, and other enterprises. Announcement has also been made that the capacity of the plant at Eureka, Ala., is to be increased to 2,000 bbls.

Several months ago the O'Neals Lime Works moved its sales office from Eureka to Birmingham, in order to keep in close touch with the building trade. For months the plant has been shipping all that could be made.

In order to extend the use of lime into the home for small jobs and miscellaneous repairing, the O'Neils Lime Works is now packing lime in five-lb. sacks, as well as the standard 50-lb. sacks. This plan has proved a very satisfactory one, and a good market has been found for small sacks.

Announcement has also been made that the Sandusky Cooperage & Lumber Co., of Ohio, is to establish a cooperage plant on the O'Neals property at Calera.

Officers of the O'Neals Lime Works are Dr. W. C. Gewin, president; W. W. Wood, vice-president; Dr. N. A. Barrett, secretary-treasurer; E. M. Confer, general manager of the plant at Eureka, Ala.

Karl E. Menear, of Bath, Pa., will move to Hudson, N. Y., to fill the position of Electrician at the Pennsylvania Cement Co.'s plant in that locality.

The first safety competition ever held at Milltown opened on Monday, May 1. The workmen at the plant have been divided into three divisions, and the division having the best safety record from May 1 until December 31 will be entertained by the Louisville Cement Co. at a banquet at the Community House at the close of a reception.

Only such accidents as cause a man to lay off will count against the record of a division. The standing of the various divisions shall be determined by a percentage based on the number of hours of labor spent in each department and the number of hours lost through accidents.

Bailey Tremper, formerly chemist for the Superior Portland Cement Co., at Concrete, Wash., is now engineer of tests for the Division of Highways of the State of Washington. C. L. Wagner is handling the duties of chief chemist, as well as superintendent of the Superior plant.

H. J. Robertson, former chief chemist of the Western States Portland Cement Co., is now with the Pierce Oil Corp. as chief chemist at Sand Springs, Okla.

The Cape Girardeau Portland Cement Co. has filed a complaint against the Chicago & Eastern Illinois Ry. and others with the Interstate Commerce Commission, protesting that the rates charged by the defendant carriers on cement to points in Kentucky and Tennessee makes it impossible for it to meet competition of cement manufacturers whose mills are located at Kosmosdale, Ky.; Speeds, Ind.; Michell, Ind.; St. Louis, Mo.; Richard City, Tenn., and Leeds, Ala.

Levi Williams, a well known foreman at the Vulcanite Cement Works, died of heart failure on May 15, having sunk to the floor as he was standing near one of the windows.

The deceased had been employed at the Vulcanite plant from the erection of its first building.

The members of the Illinois Press Association motored to the plant of the Universal Cement Co. at Buffington, Ind., on the first day of the Chicago meeting, April 27th, and inspected a process unfamiliar to most of them. Luncheon was served by the Universal company.

The Nebraska Cement Co. is busy this week shipping its product to Lincoln for use in the construction of Nebraska's new capital building.

Edgar H. Fleischman, of Nazareth, Pa., left on an extended trip to Japan. He will remain on the island for six months and will be chief engineer for the Bates Valve Co. There are several cement mills there to be equipped with the new valve bag system.

The Atlas Portland Cement Co., on behalf of its plant at Navarro, Pa., has filed a complaint with the Interstate Commerce Commission against the Central R. R. of New Jersey, and other carriers, protesting that the rates charged on cement by defendant carriers from Navarro to intermediate points in New Jersey since May 1 are unjust and unreasonable, and also in violation of the long-and-short haul provision of the Interstate Commerce Act, because they exceed in each case the rate of 7 cents per 100 lbs. applying from Navarro to Jersey City, Newark, and other ports when for transhipment by water in coastwise traffic.

The Phoenix Portland Cement Co., Nazareth, Pa., has completed improvements resulting in bringing its kiln capacity up to 90,000 bbls. per month, and its clinker grinding production up to 120,000 bbls. per month, with large savings in labor and power with this increased output.

A new complete crushing plant is being installed, including a No. 36 McCulley crusher, manufactured by the Worthington Pump and Machinery Corp., followed by a direct driven Pennsylvania hammer mill. It is anticipated that this installation will be in operation about July 1.

Among the recent sales of Ruggles-Coles dryers, which are evidence of the increased activities in the industrial field, are included shipments of a Class A-2 Ruggles-Coles dryer for drying crushed limestone, to the Peerless White Lime Co., Mosher, Mo., and a Class A-2 Ruggles-Coles dryer for drying coal at a large cement plant in Japan.

The "No-Accident" campaign at the plant of the Tidewater Portland Cement Co. during the month of May was a complete success, as no accidents occurred about the works during the month of May. The campaign was under the supervision of Monroe Wilson. Several similar campaigns were attempted in the past, but without success, each time an accident of some sort occurring during the month.

The plants of the Lehigh Portland Cement Co. at New Castle, Pa., are working at full capacity for the first time in nine months, according to reports from that locality.

P. V. Outland has severed his relationship with the Nebraska Portland Cement Co. as bookkeeper, to accept employment with the Sandusky Cement Co. at Sylvania, Ohio. Mr. Outland has been with the Nebraska Cement Co. the past eight years.

John A. Blank, who has been chemist at the Tidewater Portland Cement Co. plant the past three years, has resigned.

The various railroads operating in and around the cement plants in Northampton, Coplay, Whitehall and other points in the Pennsylvania cement belt, are supplying a large number of cars.

Shipment of cement by truck out of the Lehigh district has been resumed. The shipments are being made to nearby points.

An inspection of the cement mills in the Lehigh and Northampton County districts was completed recently by Edward J. Lynch and staff of the U. S. Bureau of Labor and Industry.

Production at the plants of the Pennsylvania Cement Co., Bath, has been heavier for the first four months this year than at any time in the history of the company. All the plants are operating at capacity and indications now are that this condition will exist for an indefinite period.

The capacity of the Superior Portland Cement Co.'s plant at Concrete has been increased by an expenditure of approximately $300,000 on improvements that were started about a year ago, and it is now capable of producing 3,500 bbls. on the raw side and 5,000 bbls. on the finished side per day. The company is now adding a new packing house, which will have a capacity of 7,000 bbls. The plant is running full blast and has about 300 men on its payroll.

Actual construction of the plant of the Signal Mountain Portland Cement Co. has begun. Work will also be started on the opening of the quarry. The production of the quarry will be utilized for concrete purposes for the present time. Orders have also been placed for the rails to be used in the siding to connect the plant with the lines of the Chattanooga Traction Co.

Over $100,000 has been spent by the company up to the present time in development work. The accomplishments include the excavation for the plant site from which over 90,000 cubic yards of earth have been removed; the construction of a new road nearly one mile in length to take the place of the present county highway; the erection of a concrete bridge over the road through which the company's feeder tracks will pass; the erection of a large stone crushing plant and the clearing of several hundred acres of land.

The brightest ray of sunshine since the industrial depression set in came with May, the Atlas Portland Cement Co. at Northampton announcing a general increase in wages. The exact amount of the increase was not nounced.

A readjustment in wages, commencing May 1, was also announced by the Lehigh Portland Cement Co. The readjustment was an increase, but the exact amount of the increase was not designated.

A wage increase, effective May 15, was announced by the officials of the Giant Portland Cement Co., Egypt.

Due to the heavy traffic in and out of Phillipsburg, N. J., to and from the cement plants along the Delaware river, an extra train has been added to the schedule to accommodate the cement workers.

The first mass meeting to be held with the annual Safety Campaign arranged by the Leehigh Portland Cement Co. throughout its plants, was held on May 30 at Ormrod, Pa., when twelve hundred workmen, their wives and children took part in the demonstrations. A feature of the event was the parade previous to the meeting, in which at least 150 school children and a band composed of workmen from the mills took part.

A full quota of men are now at work in the Edison plant at New Village, N. J.

As yet there is no noticeable effect of the soft coal strike felt in the cement plants in the Lehigh district. All the mills had a plentiful supply on June 1.

Hundreds of striking foreign coal miners arriving in Northampton, Coplay and other cement towns, from various points in the hard coal fields, are seeking employment in the cement mills. Many others are leaving for their native lands.

The Whitehall Portland Cement Co. recently fired a heavy blast, which tipped off the face of its quarry between North Coplay and Cementon.

The Atlas Engineering Society held its annual banquet in the Elks' Home, Allentown, in May, forty-five members of the society being present, with representatives of other departments of the cement company.

The National Portland Cement Co. has started getting options on a right-of-way for a branch railroad from the Ann Arbor railroad in Isabella township, across two townships to Coldwater Lake, where the company has started building a cement plant. The branch will be about ten miles long.

A 20% reduction in all Oregon railroad cement rates was to become effective on June 26, it was announced by Fred Buchtel of the public service commission. The commission's decision was made in connection with its consolidated cement cases of 1921, and is held to be in keeping with similar reductions which the commission ordered in the rates of other building materials.

The case involved complaint of the Oregon Portland Cement Co., the Portland Traffic and Transportation Association, and the State Highway Commission, with the Beaver Portland Cement Co. as intervenor.

The Nebraska Cement Co. is turning out about 2,500 bbls. of cement daily.

The Central Mill of the Giant Portland Cement Co., Egypt, resumed operation in the middle of April after a shut-down since last summer.

Only encouraging reports are heard from all of the dozen cement plants within a radius of about ten miles from Bath, Pa. This territory includes the four-unit plant of the Atlas company. All plants are reported to have booked good orders. The loading of cars at night at one of the large plants has called for a night train on the L. & N. E. R. R.

Work at Mill No. 2 of the Vulcanite Portland Cement Co. was resumed April 25, when a full force of men reported for work. The mill had been closed for a considerable period of time, and during the idleness extensive improvements were made.

The Quincy plant of the Wolverine Portland Cement Co. started operations early in May with about 100 men employed. The outlook for a full season's run is very encouraging.

The coal situation is the only element that causes any worry at the present time, but it is thought that a sufficient supply may be obtained to keep both plants running. Most of the men who had been working at Coldwater have been transferred to the Quincy plant, in addition to the others who have been employed.

The month of April was a record run at the plant of the Nebraska Cement Co., and had operations continued until the end of the month they would have had a total of 60,000 bbls. for the thirty days, an average of 2,000 bbls. per day. The three kilns were in operation.

European competition, which was becoming a serious factor in the American cement trade with the Dominican republic, has been affected by the recent reduction in the freight rate on cement in barrels from New York to Dominican ports, according to a report from Consul W. A. Bickers, at Puerto Plata.

The freight rate has been reduced from $2 to $1.25 per barrel of 400 lbs. gross weight. The demand for cement has been light for several months, but several comparatively small shipments have been received from Europe, the price asked in the Dominican republic being $4.50 per barrel, against which American cement cannot compete.

Two proposed cement companies in Mexico are incapable of pushing their projects to a conclusion at the present time. All properties and facilities required by them have been secured, but they are still inadequately financed, although both projects, if developed, promise attractive returns.

Twenty-five of the largest cement plants in Japan have consolidated with a capital of 100 million Yen. The principal purpose is to increase export by fighting competition.—*Tonindustrie-Zeitung.*

Trade Publications

Testing That Pays Dividends, by The Dorr Co., Engineers, New York City, 7½"x10½", sixteen pages, paper covers, illustrated. This interesting booklet deals with the laboratory and testing plant maintained by the Dorr Co., at Westport, Conn.

It describes the scope of the work and the procedure at the laboratory and explains the need filled by the activities of the Dorr Co. A number of instances in which the Dorr Co. have affected economy for uniform results, include the production of, the recovery of, and the treatment of several different products.

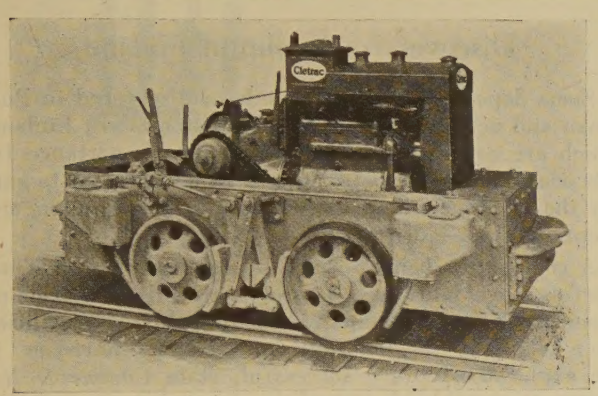
Traylor General Catalog, Bulletin 1000, Pocket Edition, by the Traylor Engineering & Manufacturing Co., Allentown, Pa. An illustrated catalog 3½"x6½", 48 pages, paper cover. This catalog lists the equipment of the Traylor Co. including bulldog jaw crushers, gyratory crushers, heavy duty crushing rolls, revolving screens, ball mills, ball-tube mills, combination mills, smelting equipment, feeders, rotary cement kilns, etc.

Bates System for Filling and Closing Bags, by the Bates Valve Bag Co., Chicago, Ill., 7 in by 10½ in., 24 pages, paper cover, illustrated.

This pamphlet describes and illustrates Bates packing machines and valve bags of cloth and paper. The Bates helical gear bench tying tool, Bates upset and wire ties and wire loop ties are also illustrated.

Cletrac Motor Powers Atlas Locomotive

A new and unique use for a tractor power plant is illustrated in the accompanying illustration of a new light industrial locomotive just announced by the Atlas Car & Manufacturing Co., of Cleveland. The model F Cletrac, made by the Cleveland Tractor Co., minus its side frames, tracks, seat and steering wheel, is set bodily into the sturdy frame, giving an unusually light, inexpensive and yet powerful industrial locomotive. This combined Cletrac-Atlas locomotive is designed for road construction, industrial railways and general plant hauling.



ATLAS-CLETRAC INDUSTRIAL LOCOMOTIVE

Coal Manual—F. R. Wadleigh, National Coal Mining News, Cincinnati, Ohio, 4½ by 6 in., 184 pp., cloth, $2.50, leather $3.50.

A book dealing with the subject of coal from the viewpoint of the consumer, or purchasing agent. It is prepared by a man with a thorough knowledge of the subject.

The subject matter has been well arranged and by the use of frequent subheads and an index information can be found readily.

Among the subjects covered are: kinds and commercial grades of coal; information in regard to the location of coal fields and the essential differences in the character of coal from various fields and seams; the preparation of coal; coke and gas manufacture; the use of coal in stationary boilers and furnaces; storage and prevention of spontaneous combustion; specifications and their use; analyses and effects of various impurities, together with a brief bibliography on the subject of coal.

Reducing Valves, by the Atlas Valve Co., Newark, N. J.; 4 in by 7 in., 28 pp., illustrated, paper cover. This is a reference book of rules, tables, curves, data and formulae to determine the correct sizes and capacities of reducing valves; also for determining the capacity of flow of steam in pipes of different diameters and different losses in pressure.

After 15 years of experience in the manufacture, sale and installation of reducing valves, the Atlas Valve Co. is making an interesting announcement. It is stated that most reducing valves as used today are needlessly large—often twice or three times too large—consequently these valves are needlessly expensive. The matter of reducing valve economics is covered in the new handbook, going into careful detail on all points that are closely connected with and vital to reducing valves.

The Hardinge Conical Mill—By the Hardinge Co., New York City. This is a condensed bulletin covering Hardinge conical mill, illustrated. Information covered in the bulletin includes products, principles of operation, application to industrial and metallurgical processes. Dimensions and specifications for conical ball and conical pebble mills are also included.

Corrosion Tests With Cal

A LETTER FROM THE CAL CHEMICAL CO.

The statement in your April issue of CONCRETE, containing the conclusions of the Bureau of Standards in regard to the addition of calcium chloride in small quantities to standard portland cement mixtures, is of special interest, because the value of such material is being more generally recognized and its use is increasing. The comments as to corrosion are peculiarly pertinent.

All cement carries calcium sulphate, which in itself tends to aid corrosion. This can be easily seen by taking a brightened nail and dropping in distilled water to which has been added some plaster of paris. Yet the alkalinity of the portland cement, under the conditions of proper use and a limited amount of gypsum, is sufficient to fully protect against injurious corrosion. The addition of plain calcium chloride to standard cements simply adds a somewhat further strain on the powers of the cement proper to protect itself against corrosion; but in most cases, as the Bureau has pointed out, it is still equal to the task. It is believed that any objection which might exist is obviated when the calcium chloride is added as an oxychloride, in which case there is always carried enough additional lime to neutralize the chloride. This was fully set forth in an article by Dr. J. C. Witt, which appeared in the February, 1921, edition of CONCRETE, in which he showed that Cal, which is an oxychloride of calcium, actually reduced corrosion in certain cases. This can be readily tested out by anyone who is interested. For instance, if brightened nails are put into flasks containing distilled water, to one of which is added gypsum, to one 4% of calcium chloride, to one 8% of Cal, the first two will be seen to corrode actively, while the latter will be free from corrosion. More than that, 4% of calcium chloride can be added to the flask containing Cal and rusting will be wholly prevented or greatly reduced.

The Cal company is carrying on a complete series of tests under conditions of great severity, in which very thin sections, containing steel, are exposed to partial immersion. These tests, which are now in the second year, would indicate that there is no increased corrosion due to time of exposure.

Formala for Strength of Rope

How strong is a rope? At the Bureau of Standards laboratories in the Department of Commerce, tests have been made that have resulted in answering that question with a formula.

For three-strand regular lay manila rope from ½ in. to 4½ in. in diameter, the following computation will give the breaking load of the rope:

The average breaking load in pounds equals 5,000 multiplied by the diameter of the rope in inches, multiplied by the diameter of the rope increased by one.

This will give, of course, the average maximum weight that the rope will hold, but the working load or the load that a contractor or safe-hauler may apply with proper safety and precaution would be considerably less than the load given by the formula.

Other data on rope are contained in Technologic Paper of the Bureau of Standards No. 198, by A. H. Stang and L. R. Strickenberg, which has just been issued.

Portland Cement in Yorkshire, England

What is probably the largest industrial concern that has been established in Yorkshire since the war has commenced operation on the Humber bank, ten miles west of Hull. Describing these works, the *Yorkshire Post* states that the works are spread over 600 acres, with rail and river frontages extending over a quarter of a mile. They are served by a special railway station at Melton, on the main line between Leeds and Hull, and permission has already been given by the Humber Conservancy for the erection of a wharf on the river side. The huge buildings forming the factory stand between the Melton quarries (which yield practically unlimited supplies of chalk) on the north, and the flats of alluvial clay deposited by the Humber on the south, so that the raw material is on the spot, and not one penny will have to be paid to carry it to the factory. Moreover, the company has its own water supply, and the South Yorkshire coal field is only 25 miles away.

An interesting feature of the undertaking is that the works are run entirely by electricity from mains laid by the Hull Corporation; a ten-mile cable conveys from the Hull power station 35,000 units a day.

At Melton the chalk appears just below a thin covering of turf, and the great "digger," working on a face about 20 ft. deep, tears out the stone at the rate of 4 tons per scoop, and drops it into the wagons, which, on an ordinary gauge railway, with a gradient of 1 in 30, conveys it to the revolving crushers in a ferro-concrete building, which alone cost £40,000. From the crushers the chalk, after being treated to another reducing process, is passed as "slurry" into the great mixing tanks, which have a capacity of 1,500 tons, where it receives its proportion of clay.

A group of six storage tanks, each 80 ft. high, and holding about 700 tons of "slurry," is a dominant feature in the landscape. In these tanks the liquid is kept moving by powerful currents of compressed air, until it is required for the kilns, where it is cooked into clinkers. Machinery driven by 400 h. p. motors crushes these clinkers into a powder, which is conveyed automatically into a ferro-concrete silo, holding fully 6,000 tons. Finally, the finished cement is passed into the store, a building 140 ft. long by 60 ft. wide, where the product is heaped up to a height of 25 ft. Even in packing, manual labor is dispensed with, the sacks being weighed, filled, and delivered automatically at the rate of 300 per hour, ready to be put on rail.

Discovery of Kaolin in Finland

Some deposits of kaolin have been discovered in Puolanka and neighboring parishes of Osterbotten, Finland, which are considered of great ecomonic importance for this country, as it is hoped they will be sufficient to supply the requirements of the domestic paper, ceramic, and fireproof brick industries.

A company is being formed by business men in Tammerfors to explore the deposits carefully this coming summer. A larger company will probably be organized later to utilize the material for technical purposes, if the explorations prove successful, state *Commerce Reports*. Part of the deposits being located on State lands, it is proposed to give the state the opportunity to become a shareholder in the company to the extent of one-third of the capital, which will amount to about 6,000,000 Finnish marks (the normal value of the Finnish mark is $0.193, but it is now greatly depreciated).

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